DEMOGRAPHICS OF THE SOUTHWESTERN WILLOW FLYCATCHER ALONG THE LCR

SWCA

DEMOGRAPHICS

- Productivity and Survival are important aspects of population dynamics of a species

- **Questions:**
- **Part 1:** What is flycatcher nest survival rate?
  - What environmental variables most affect nest success?
- **Part 2:** What is annual flycatcher survival rate?
  - Both for adults and juveniles, and how do flycatchers move across the landscape?

PART 1: NEST SURVIVAL

- Questions:
- What is flycatcher nest survival and fecundity?
- What environmental variables most affect nest success?

NEST MONITORING

- 11 sites across Nevada and Arizona
- Nests monitored May-Aug 2013-2017

NEST MONITORING

- Every several days, nest contents checked with mirror pole
- Nest considered successful only if fledgling was visually confirmed outside the nest

NEST MONITORING EFFORT

- 466 flycatcher nesting attempts documented
- 382 known fate nests across all study sites

- Calculated apparent and Mayfield nest success, as well as fecundity

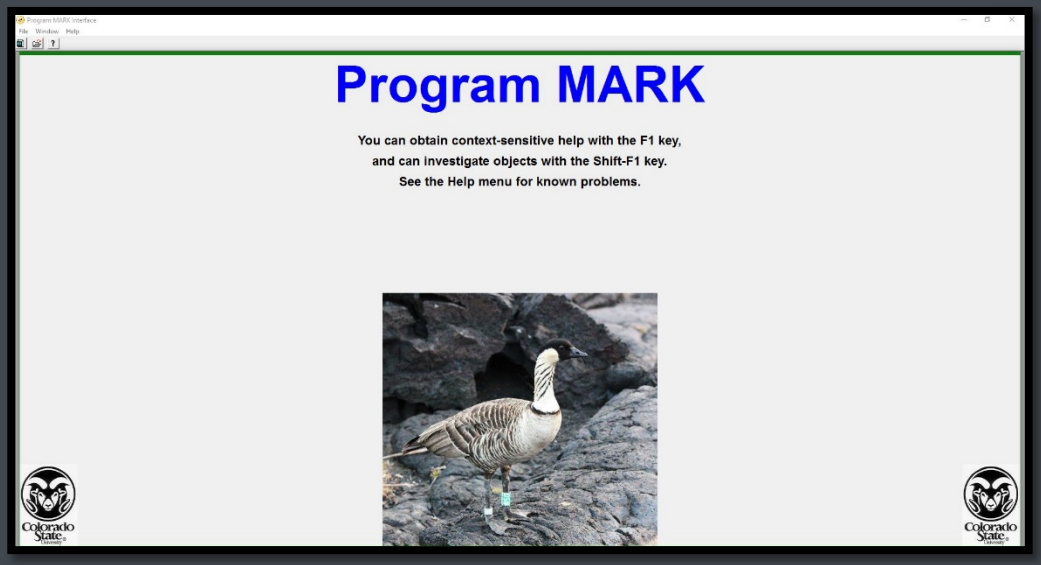
- Modeled nest survival to determine important variables affecting nest success

NEST SUCCESS

- Overall apparent nest success 2013-2017 = **52%**
- Nest survival over the length of an average nesting attempt 2013-2017 = **47%**
  - From Mayfield method
- Young fledged per female (fecundity) = **1.18**

NEST SURVIVAL MODELING

- Program MARK
  - Maximum likelihood method
  - Model selection based on AICc values
  - Allows additive and interactive effects of covariates



NEST SURVIVAL MODELING

- 292 nests of known fate monitored between 2013 – 2017 included

- Allows more in-depth results than using apparent or Mayfield nest success metrics
  - Can incorporate covariates to help explain nest success
  - Apparent nest success and Mayfield methods have inherent bias and more restrictive assumptions

NEST SURVIVAL MODELING

- Covariates used:
  - Year
  - Date
  - Study Area
  - Nest Age
  - Nest Substrate
  - Nest height
  - Amount of Tamarisk in close proximity
  - Amount of saturated soils in vicinity

MARK MODEL RESULTS

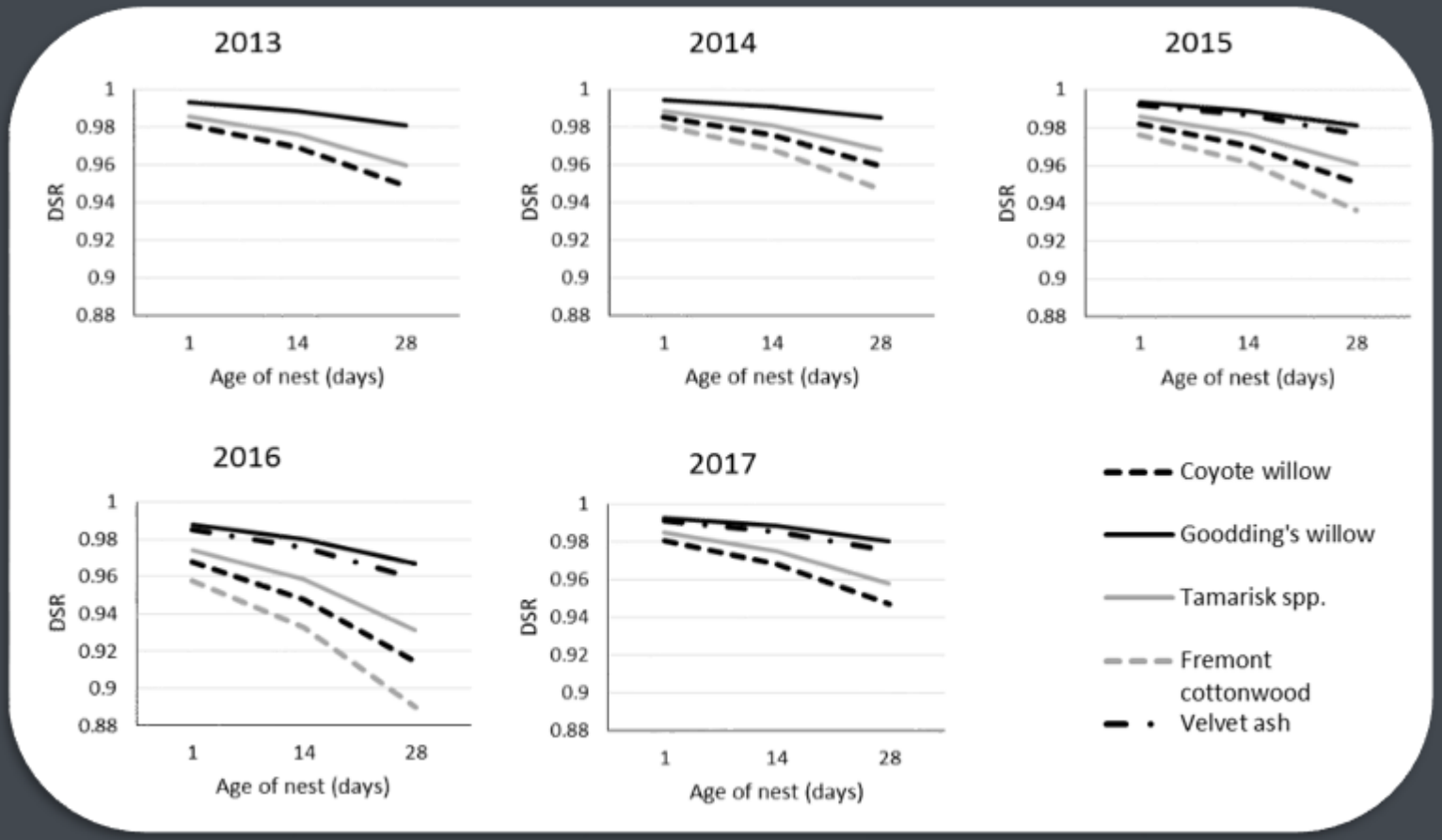
Table 4-8.—Models within two ΔAICc scores from the highest ranked daily nest survival model, 2013–17

Model	AICc	ΔAICc	AICc weight	Model likelihood	Number. of parameters	Deviance
S{Age+Year+Substrate}	870.1514	0	0.16742	1	10	850.1119
S{Age+Year+Substrate+Sat50}	871.4267	1.2753	0.08849	0.5285	11	849.3792
S{Age+Year+Substrate+Height}	871.821	1.6696	0.07266	0.434	11	849.7735
S{Age+Year+Substrate+Date}	872.0772	1.9258	0.06392	0.3818	11	850.0298
S{Age+Year+Substrate+Tasp5}	872.1183	1.9669	0.06262	0.374	11	850.0709

MARK MODEL RESULTS

- Age: survival decreases as the nest gets older
- Yearly variation is important
- Substrate: survival is highest in Goodding's Willow

SURVIVAL OVER THE NESTING PERIOD



NEST SURVIVAL FACTORS

- Nest survival modeling can paint a larger picture of how landscape factors affect breeding success
- Nest substrate may be a proxy for local environmental conditions
  - Areas high in Goodding's willow had highest survival
  - Most Goodding's willow at PAHR and ALAM
- Survival decreases with age of nest
  - Likely due to depredation being the main cause of failure

PART 2: SURVIVAL AND MOVEMENT

- Long-term monitoring of a known identity population enables analysis of life history parameters and movements

- **Questions:**
- What are flycatcher survival rates?
- How do flycatchers shift across the landscape?

METHODS

- Adults and nestlings banded with unique color band combinations at every site with resident flycatchers
  - 11 sites across NV and AZ
  - Enabled resighting of individuals
- Modeled survival and calculated a rate of population change

FLYCATCHER DETECTIONS

- Total adult, resident flycatchers ranged from 99 (in 2013) to 200 individuals (in 2017)
  - Majority at Alamo Lake, Pahranagat, and Key Pittman
- From 2013 - 2017, SWCA banded:
  - 143 adult flycatchers
  - 297 juvenile flycatchers

FLYCATCHER SURVIVAL

- Model estimates of survival probability differed for adults and juveniles:
  - Adults 59%
  - Juveniles 30%
- Mean Life Expectancy (calculated from survival probabilities) was 1.17 years

FLYCATCHER SURVIVAL

- Survival in these areas is on par with other studies of this species
- Largest source of mortality has been shown to be during migration for flycatchers and other species
- Juvenile survival decreased with fledge date, suggesting that fledging earlier in the season may increase the odds of survival during their first migration

FLYCATCHER MOVEMENTS

- Lambda (rate of population change) calculated from fecundity, survival, and recruitment (Pradel models)
  - Havasu 1.018 (data from 1997 – 2017)
  - Pahranagat Valley 1.031 (data from 2011 – 2016)
- Population trends (linear regression) negative
  - Pahranagat Valley, NV: -3.4%
  - Havasu area, AZ: -5.6%
- Pradel models overestimate recruitment if sample sizes are low and/or survival is low
- Most of the recruitment into the Havasu area is through immigration (80%), while in Pahranagat Valley it is through local recruitment (69%)

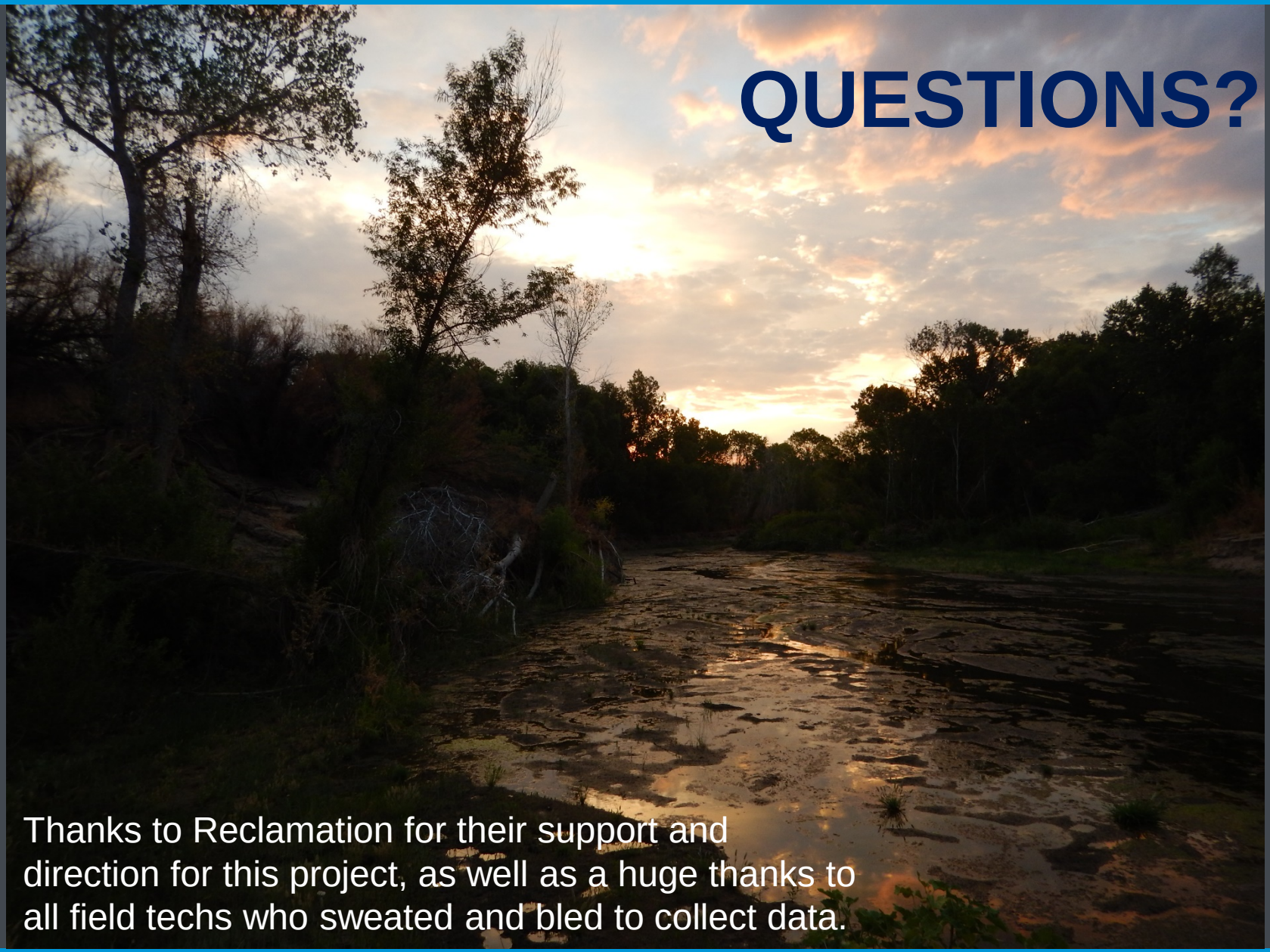
MOVEMENTS BETWEEN AREAS

- Many movements within drainages
- Few movements between drainages
- Juvenile dispersal and adult movement from Alamo Lake to the Bill Williams was recorded
  - Possibly Alamo Lake is the source for the populations still in the Havasu area

TAKE HOMES

- Nest Survival:
  - Modeling survival is a useful tool and indicated that areas with more Goodding's willow have higher nest success
  - Nest depredation is the main cause of nest failure

- Survival:
  - Adult and juvenile survival is on par with other studies for this species, but population trends are declining
  - Havasu area seems to be a population sink as local recruitment is low and immigration high



QUESTIONS?

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